

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appellant: Nikolay Korovin et al.
Serial No.: 10/605,447
Filing Date: September 30, 2003
Title: INTEGRATED PRESSURE CONTROL SYSTEM FOR WORKPIECE CARRIER
Examiner: Timothy V. Eley
Art Unit: 3724

TO: Mail Stop APPEAL BRIEF-PATENTS
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

**APPELLANT'S SUBSTITUTE BRIEF
PURSUANT TO 37 C.F.R. § 41.37**

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Dear Commissioner:

Appellant appeals the decision of the Examiner finally rejecting all of the claims pending in the present application, namely claims 15-23.

I. REAL PARTY IN INTEREST

SpeedFam-IPEC Corporation, which is owned by Novellus Systems, Inc., is the real party in interest in the subject patent application by virtue of an Assignment from inventors Nikolay Korovin, Steve Schultz, and John Herb to SpeedFam-IPEC Corporation (recorded on September 30, 2003 at Reel 014001, Frame 0059).

II. RELATED APPEALS AND INTERFERENCES

No other appeals or interferences are currently known that will directly affect, be directly affected by, or have a bearing on the decision to be rendered by the Board of Patent Appeals and Interferences in the present Appeal.

III. STATUS OF CLAIMS

Claims 1-22 were cancelled without prejudice or disclaimer.

Claims 12-14 are withdrawn.

Claims 15-23 are pending in the application.

Claims 15-23 stand rejected under 35 U.S.C. § 103(a) and are appealed herein.

Claim 24 was cancelled without prejudice or disclaimer.

Claim 25 is withdrawn.

IV. STATUS OF AMENDMENTS

No amendments were filed after the Examiner's Final Office Action.

V. SUMMARY OF CLAIMED SUBJECT MATTER

The pending application relates to an integrated pressure control system for a workpiece carrier that applies pressure to the back surface of a workpiece during planarization. (See specification, paragraph 0008). In one exemplary embodiment, the integrated pressure control system for planarizing a workpiece has a multizone workpiece carrier with a plurality of pressurizable zones in a pressure control system mounted to the carrier for controlling the pressure that is provided to the multiple pressurizable zones. The pressure control system may include at least one pressure transducer, at least one valve, an automatic calibration system, and a rotary union for connecting electrical lines to the pressure control system. (See specification, paragraph 0012). Another exemplary embodiment of the invention includes a carrier insert for a multizone workpiece carrier which includes a pneumatic manifold having a plurality of ports that are aligned with multiple pressurizable zones located in the multizone workpiece carrier and at least one pressure transducer mounted to the pneumatic manifold for directing pressure through the ports. The carrier insert may also include at least one valve mounted to the pneumatic

manifold and a control board mounted to the pneumatic manifold. (See specification, paragraph 0013).

In addition, all of the claims pending on appeal are outlined below along with specific references to the specification of the patent application. Additional support may be present in the specification for various elements.

15. An integrated pressure control system for planarizing a workpiece comprising:
a multizone workpiece carrier having a plurality of pressurizable zones (*specification, paragraphs 0012, 0026 and 0029, and Figs. 2 and 3*);
a pressure control system mounted to said carrier for controlling pressure provided to said plurality of pressurizable zones (*specification, paragraphs 0012 and 0026*); and
a rotary union mounted on said carrier for connecting electrical lines to said pressure control system (*specification, paragraph 0029 and Fig. 3*).

16. (Previously Presented): The integrated pressure control system of claim 15 further comprising an automatic calibration system for calibrating said pressure control system (*specification, paragraphs 0012 and 0035*).

17. (Previously Presented): The integrated pressure control system of claim 15 wherein said pressure control system comprises at least one pressure transducer (*specification, paragraphs 0012 and 0029 and Figs. 3, 4 and 6*).

18. (Previously Presented): The integrated pressure control system of claim 17 wherein said pressure control system further comprises at least one valve (*specification, paragraphs 0012 and 0029 and Figs. 3, 4 and 6*).

19. (Previously Presented): The integrated pressure control system of claim 15 wherein said rotary union further connects an air supply line and an air exhaust line to said pressure control system (*specification, paragraph 0012 and Fig. 3*).

20. (Previously Presented): A workpiece carrier comprising:
a carrier housing (*specification, paragraph 0009 and Fig. 3*);
a workpiece bladder coupled to said housing, said workpiece bladder having a surface configured to press against a surface of a workpiece (*specification, paragraph 0009 and Fig. 3*);

at least one pressure transducer mounted to said carrier housing for controlling pressure provided to said workpiece bladder (*specification, paragraph 0009 and Fig. 3*); and

a rotary union mounted to said carrier for connecting said at least one pressure transducer with a control board (*specification, paragraph 0029 and Fig. 3*).

21. (Previously Presented): The workpiece carrier of claim 20 wherein said bladder comprises a plurality of pressurizable zones and each zone has a pressure transducer for monitoring pressure to that zone (*specification, paragraph 0010 and Fig. 3*).

22. (Previously Presented): The workpiece carrier of claim 20 further comprising at least one valve mounted to said carrier (*specification, paragraph 0010 and Fig. 3*).

23. (Previously Presented): The workpiece carrier of claim 20 wherein said control board is mounted to the carrier. (*specification, paragraph 0011*).

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Claims 15, 17, 19-21 and 23 stand rejected under 35 USC 103(a) as being unpatentable over Liu et al., U.S. Patent No. 5,720,845, in view of Maloney et al., U.S. Patent No. 7,029,382.

Claims 15, 17, and 19-21 stand rejected under 35 USC 103(a) as being unpatentable over Berman et al., U.S. Patent Publication No. 2003/0211811, in view of Maloney et al.

Claim 16 stands rejected under 35 USC 103(a) as being unpatentable over Liu et al. or Berman et al., each considered independently, in view of Berman et al. and Zias et al., U.S. Patent No. 4,051,712.

Claims 18 and 22 stand rejected under 35 USC 103(a) as being unpatentable over Liu et al. in view of Maloney et al. and further in view of Muller et al., U.S. Patent No. 5,980,361.

VII. ARGUMENT

A. The Examiner Has Not Established a *Prima Facie* Case of Obviousness

The Examiner has the initial burden to establish a *prima facie* case of obviousness. To establish a *prima facie* case of obviousness, the Examiner must establish that: (1) the prior art reference (or the references when combined) teaches or suggests all the elements of Appellant's

claims; and (2) there is some suggestion, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to combine or modify the references.

To establish a *prima facie* case of obviousness, the Examiner must show either how the prior art references suggest, either expressly or impliedly, the combination that results in Appellant's claims or, alternatively, the Examiner must present a convincing line of reasoning as to why one skilled in the art would have found the claims to have been obvious in light of the teachings of the references. *Ex parte Clapp*, 227 U.S.P.Q. 972, 973 (Bd. of Pat. Appeals and Interferences, 1985). When the motivation to combine the teachings of the prior art references is not immediately apparent, it is the duty of the Examiner to explain why the combination of the teachings is proper. *Ex parte Skinner*, 2 U.S.P.Q.2d 1788 (Bd. of Pat. Appeals and Interferences, 1986). Significantly, the fact that references can be combined or modified does not render the resultant combination obvious unless the prior art suggests the desirability of the combination. *In re Mills*, 916 F.2d 680 (Fed. Cir., 1990). The teaching or suggestion to make a claimed combination must be found in the prior art and must not be based on Appellant's disclosure. *In re Vaeck*, 947 Fed.2d 488 (Fed. Cir., 1991).

The test of obviousness is not whether features of a secondary reference may be bodily incorporated into a primary reference's structure, nor whether a claimed invention is expressly suggested in any one or all of the references. Instead, the test is what the combined teachings of references would have suggested to those of ordinary skill in the art. *In re Keller, Terry, and Davies*, 208 U.S.P.Q. 871, 881 (C.C.P.A., 1981). The mere fact that the prior art may be modified to reflect features of the claimed invention does not make the modification, and hence the claimed invention, obvious unless the desirability of such a modification is suggested by the prior art. The claimed invention cannot be used as an instruction manual or "template" to piece together teachings of the prior art so that the claimed invention is rendered obvious. *In re Fritsch*, 23 U.S.P.Q.2d 1780, 1783-84 (C.A.F.C., 1992).

1. Claims 15, 17, 19-21 and 23

Claims 15, 17, 29-21 and 23 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Liu et al. in view of Maloney et al. In particular, the Examiner argued that Liu et al. discloses a workpiece carrier including an integrated pressure control system where the workpiece carrier includes a carrier housing, a workpiece bladder coupled to the housing, the workpiece bladder having a surface configured to press against a surface of a workpiece; and at

least one pressure transducer mounted to the carrier housing for controlling pressure provided to the workpiece bladder. Although the Examiner conceded that Liu et al. does not disclose a rotary union for connecting electrical lines, an air supply line, and an air exhaust line to the pressure control system, the Examiner argued that Maloney et al. discloses that it is well known in the art to provide a rotary union mounted to a workpiece carrier for communicating stationary supply sources/lines external to the carrier with the carrier and locations on the carrier by allowing the sources/lines to pass therethrough. Accordingly, the Examiner contended that it would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the Liu et al. apparatus by providing a rotary union mounted to the workpiece carrier for connecting electrical lines, an air supply line, and an air exhaust line to the pressure control system by allowing the lines to pass therethrough as taught by Maloney et al. Further, with regard to claim 17, the Examiner stated that the pressure control system in Liu et al. comprises at least one pressure transducer and with regard to claim 19, the rotary union in Maloney et al., as modified, includes an air supply line and an air exhaust line. In addition, the Examiner stated that with regard to claims 20 and 23, the workpiece carrier in Liu et al. further comprises a control board which is mounted to the carrier and with regard to claim 21, the bladder in Liu et al. comprises a plurality of pressurizable zones and each zone has a pressure transducer for monitoring a pressure to that zone.

The Examiner further argued that Maloney discloses a rotary union mounted to a workpiece carrier since the rotary union in Maloney is mounted to the shaft, which is in turn mounted to the carrier. The Examiner further argued that the rotary union in Maloney is mounted on the carrier, since the shaft is mounted on the carrier, and the rotary union is mounted on the shaft.

Despite the Examiner's arguments, Maloney et al. fails to disclose a rotary union mounted on said carrier for connecting electrical lines to the pressure control system. Maloney et al. also fails to disclose a rotary union mounted to said carrier for connecting at least one pressure transducer with a control board. Appellant's use of the term "on" in Appellant's independent claim 15 is used as a function word to indicate position and contact with another surface. Appellant's independent claim 15 requires a rotary union mounted on the carrier, not a rotary union mounted on another item where the item is in turn mounted on the carrier. The Examiner contends that Appellant fails to recite that the rotary union is mounted directly to the

carrier. However, Appellant's use of the phrase "mounted on said carrier" means exactly that and one of ordinary skill in the art would interpret a rotary union mounted on the carrier to mean that the rotary union is mounted on the carrier itself and not on another item located between the carrier and the rotary union. Further, Appellant's use of the word "to" in Appellant's independent claim 20 is used as a function word to indicate contact. Accordingly, a rotary union mounted to a carrier defines a rotary union which is in contact with the carrier, not a rotary union that is mounted to another item where the other item is in turn mounted to the carrier. The Examiner again contends that Appellant fails to recite that the rotary union is mounted directly to the carrier. However, Appellant's use of the phrase "mounted to said carrier" means exactly that and one of ordinary skill in the art would interpret a rotary union mounted to the carrier to mean that the rotary union is mounted to the carrier itself and not another item located between the carrier and the rotary union.

As previously argued by Appellant, Maloney fails to disclose a rotary union mounted to a workpiece carrier for controlling pressure provided to a workpiece bladder and/or a plurality of pressurizable zones. Instead, Maloney discloses a rotary union that provides a means for coupling pressurized and non-pressurized fluids between a fluid source, such as a vacuum source, which is stationary and non-rotating and a rotatable polishing head wafer carrier assembly by mounting the rotary union "to the non-rotatable portion of the polishing head" to provide "means for confining and continually coupling a pressurized or non-pressurized fluid between a non-rotatable fluid source and a region of space adjacent to an exterior surface of the rotatable spindle shaft 119." (See column 11, lines 11-20 in Maloney). Fig. 4 in the disclosure in Maloney specifically discloses that the non-rotatable portion of the rotary union is connected to the rotatable shaft (see column 11, lines 29-32) and that multiple passageways extend from the exterior shaft surface in the top of the shaft to hollow bores within the spindle shaft (see column 11, lines 37-40). Unlike Appellant's claimed invention, Maloney fails to disclose mounting a rotary union to a wafer carrier or workpiece carrier.

Further with regard to claim 17, the Examiner has again relied on the combination of Liu and Maloney and further stated that a pressure control system comprising at least one pressure transducer (29) is disclosed in Liu. Appellant respectfully disagrees that this disclosure further supports the combination of Liu and Maloney to arrive at Appellant's claims.

Liu describes a carrier in which the pressure on the wafer is applied by actuators with

moving parts which are located on the workpiece carrier. In contrast, Appellant's invention does not utilize mechanically moving parts to apply pressure but instead applies pressure through air inflation of pressurizable zones. Inlet valves 35 and exhaust valves 37 are utilized to control the pressure flow and pressure transducers 38 are coupled with the inlet valves and exhaust valves in order to control the inlet valves and exhaust valves. (See Appellant's specification, paragraph 0026). Therefore, the actuators used in Liu to provide downward force on the wafer would not have made it obvious to one of ordinary skill in the art to combine the teachings of Liu with the rotary union of Maloney to arrive at Appellant's claims.

2. Claims 15, 17 and 19-21

Claims 15, 17 and 19-21 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Berman et al. in view of Maloney as applied in the Examiner's rejection filed November 27, 2006. In that rejection, the Examiner stated that Berman discloses "a workpiece carrier comprising; inherently a carrier housing, a workpiece bladder (14) coupled to the housing, the workpiece bladder having a surface configured to press against a surface of a workpiece; and at least one pressure transducer (20) mounted to the carrier housing for controlling pressure provided to the workpiece bladder. See Fig. 1, paragraphs 20, 25, 26 and 28." Although the Examiner concedes that Liu (we suspect the Examiner means Berman here) fails to disclose a rotary union for connecting electrical lines, an air supply line, and an air exhaust line to the pressure control system, the Examiner argues that Maloney discloses that it is well known in the art to provide a rotary union mounted to a workpiece carrier for communicating stationary supply sources/lines external to the carrier with the carrier in locations on the carrier by allowing the sources/lines to pass therethrough. Accordingly, the Examiner contends it would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the Berman apparatus by providing a rotary union mounted to the workpiece carrier for connecting electrical lines, an air supply line, and an air exhaust line to the pressure control system by allowing the lines to pass therethrough as taught by Maloney.

Berman discloses a substrate carrier having a deformable surface for receiving a substrate and addressable transducers which apply pressure to pressurizable application zones. A controller can control the amount of force that the addressable transducers press with. (See paragraph 0032 of Berman). In contrast, Maloney uses a completely different force to exert pressure on the workpiece. Instead, Maloney utilizes pressurized pneumatic fluids to apply

pressure to pressurizable zones. Therefore, it would not have been obvious to one of ordinary skill in the art to combine the transducers disclosed in Berman with the apparatus disclosed in Liu to arrive at Appellant's claimed invention.

Moreover, as previously argued, Maloney fails to disclose a rotary union mounted to a workpiece carrier or wafer carrier. Instead, Maloney discloses connecting a rotary union to a spindle shaft of a polishing head to provide multiple passageways for pressurized and non-pressurized fluids. Berman also fails to disclose a rotary union mounted to a wafer carrier to connect one or more pressure transducers with a control board. Instead, Berman discloses the preferable use of digitally selectable addressable transducers by stating the following: "One reason why it is preferred that the addressable transducers 18 be digitally selectable is so that few lines 22 are required to individually select the addressable transducers 18 and thus the lines 22 do not require much room in the arm 36. This is beneficial because it is desirable to not increase the size of the arm 36 to accommodate a large bundle of lines 22 and also because the substrate carrier 12 preferably rotates on the end of the arm 36, and connection for many lines 22 through the rotating connections would be expensive and complicated." (See Berman, paragraph 0027). Accordingly, in that neither Berman or Maloney discloses each and every element of Appellant's claimed invention, namely a rotary union mounted to a wafer carrier or workpiece carrier. Appellant's claimed invention cannot be obvious in view of Berman and Maloney.

3. Claim 16

Claim 16 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Liu or Berman, each considered independently, in view of Berman and Zias et al., as applied in the Examiner's rejection filed November 27, 2006. In that rejection, the Examiner relied on his previously explained disclosures of Liu and Berman. The Examiner then conceded that although Neither Liu nor Berman disclosed an automatic calibration system for calibrating at least one pressure transducer, the Zias reference discloses that it is well known in the art to automatically calibrate a pressure transducer in order to maintain a desired pressure level. Therefore, the Examiner contended that it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified both the Liu and Berman apparatuses, each considered independently, by providing an automatic calibration system for automatically calibrating at least one pressure transducer as taught by Zias in order to maintain desired pressure levels in the apparatus.

As previously argued above, Appellant contends that neither Liu nor Berman disclose a rotary union mounted to a workpiece carrier. In addition, Zias also fails to disclose this element. Therefore, it could not have been obvious to one of ordinary skill in the art to arrive at Appellant's claim 16, which requires this limitation, in view of Liu and Zias or Berman and Zias.

4. Claims 18 and 22

Claims 18 and 22 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Liu in view of Maloney and further in view of Muller et al., as applied to claims 3 and 9 which were rejected in the Examiner's rejection filed November 27, 2006. In that rejection, the Examiner relied on his previously explained disclosure of Liu. The Examiner then conceded that although Liu does not disclose at least one valve for the control system, Muller discloses control valves for independently operating pressure chambers in a workpiece carrier for individually actuating different areas of a support plate. Therefore, the Examiner contended that it would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the Liu apparatus by providing control valves for independently operating each of the actuators as taught by Muller for better control of the apparatus.

As previously argued above, the Liu reference fails to disclose a rotary union mounted to a workpiece carrier. In addition, Muller also fails to disclose this limitation which is required by Appellant's claims 18 and 22. Accordingly, it could not have been obvious to one of ordinary skill in the art to arrive at Appellant's claims in that neither Liu or Muller, either alone or in combination, disclose each and every element of Appellant's claimed invention.

B. The Examiner Has Not Established a *Prima Facie* Case of Obviousness by a Preponderance of the Evidence

As mentioned above, the Examiner has the initial burden of factually supporting a *prima facie* case of obviousness. This has not been done. Additionally, the Examiner must prove his case by a preponderance of the evidence, with due consideration to the persuasiveness of any arguments in rebuttal. *In re Attacher*, 977 F.2d 1443 (Fed. Cir., 1992). When the motivation to combine the teachings of the prior art references is not immediately apparent, it is the duty of the Examiner to explain why the combination of the teachings is proper. *Ex parte Skinner*, 2 U.S.P.Q.2d 1788 (Bd. of Pat. Appeals and Interferences, 1986). Moreover, the fact that references can be combined or modified does not render the resultant combination obvious

unless the prior art suggests the desirability of the combination and/or modification. In re Novo, 916 F.2d 680 (Fed. Cir., 1990). Furthermore, the Examiner cannot suggest the combination or modification based on hindsight reconstruction.

As shown above, the Examiner has failed to meet his burden of persuasion. For example, the Examiner has failed to identify Appellant's required element of a rotary union mounted on, or mounted to, a carrier in any of the Examiner's cited references and has also failed to point out any instances where the prior art references suggest the desirability of modifying the elements disclosed in the cited references to achieve Appellant's required claim elements. Therefore, because the Examiner did not establish by a preponderance of the evidence a *prima facie* case of obviousness, Appellant respectfully submits that the associated rejections of claims 15-23 should be withdrawn.

VIII. CONCLUSION

For the above reasons, Claims 15-23 are not obvious to one skilled in the art having knowledge of the Liu et al., Maloney et al., Berman et al., Zias et al., and Muller et al. references. Accordingly, Appellant respectfully submits that Claims 15-23 are patentable over the prior art and respectfully requests this Board to so indicate.

Appellant authorizes and respectfully requests that any fees due be charged to Deposit Account No. 19-2814.

Respectfully submitted,

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IX. CLAIMS APPENDIX

15. An integrated pressure control system for planarizing a workpiece comprising:
 - a multizone workpiece carrier having a plurality of pressurizable zones;
 - a pressure control system mounted to said carrier for controlling pressure provided to said plurality of pressurizable zones; and
 - a rotary union mounted on said carrier for connecting electrical lines to said pressure control system.
16. The integrated pressure control system of claim 15 further comprising an automatic calibration system for calibrating said pressure control system.
17. The integrated pressure control system of claim 15 wherein said pressure control system comprises at least one pressure transducer.
18. The integrated pressure control system of claim 17 wherein said pressure control system further comprises at least one valve.
19. The integrated pressure control system of claim 15 wherein said rotary union further connects an air supply line and an air exhaust line to said pressure control system.
20. A workpiece carrier comprising:
 - a carrier housing;
 - a workpiece bladder coupled to said housing, said workpiece bladder having a surface configured to press against a surface of a workpiece;
 - at least one pressure transducer mounted to said carrier housing for controlling pressure provided to said workpiece bladder; and
 - a rotary union mounted to said carrier for connecting said at least one pressure transducer with a control board.
21. The workpiece carrier of claim 20 wherein said bladder comprises a plurality of pressurizable zones and each zone has a pressure transducer for monitoring pressure to that zone.

22. The workpiece carrier of claim 20 further comprising at least one valve mounted to said carrier.

23. The workpiece carrier of claim 20 wherein said control board is mounted to the carrier.

X. EVIDENCE APPENDIX

None

XI. RELATED PROCEEDINGS APPENDIX

None

A